IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	Patch, Sarah K.
Serial No.	:	10/800,957
Filed	:	March 15, 2004
For	:	Method and System of Thermoacoustic Computed Tomography
Group Art No.	:	3737
Examiner	:	Elmer M. Chao

CERTIFICATION UNDER 37 CFR 1.8(a) and 1.10

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PRE-APPEAL BRIEF CONFERENCE REQUEST

Dear Sir:

Applicant requests review of the final rejection in the above-identified application. No amendments have been made with this request. The request is being filed with a Notice of Appeal. The review is requested for the reasons set forth hereinafter.

<u>REMARKS</u>

Claims 1-26 are pending in the present application. In the Final Office Action mailed April 27, 2007, the Examiner rejected claims 1-12 under 35 U.S.C. §101. The Examiner next rejected claims 1-3, 5-9, 13, 16-19, and 24-26 under 35 U.S.C. §102(b) as being anticipated by Kruger (USP 6,216,025). Claim 4 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kruger in view of Takashima (JP363211879). Claims 10-12, 13-15, 20, 21, and 23 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kruger in view of Ben-Haim et al. (US Pub. 2002/0065455). Claim 22 was rejected under 35 U.S.C. §103(a) as being unpatentable over Kruger in view of Ben-Haim et al., and further in view of Maas, III (US 6,181,832).

The Examiner has erred procedurally by citing art that does not teach every element as called for in the claims.

Claims 1, 13, and 24 were rejected under 35 U.S.C. §102(b) as being anticipated by Kruger. Claim 1 calls for, in part, determining a second set of TCT data from a first set of TCT data. Claim 13 calls for, in part, a TCT imaging system having a computer programmed to derive, from acquired data, unacquired data for an imaging object. Claim 24 calls for, in part, generating a first TCT dataset from the ultrasonic emissions and deriving a second TCT dataset from the first TCT dataset.

Kruger teaches specific arrangements of multiple transducers on a rotatable imaging bowl for measuring acoustic waves produced in tissue when the tissue is exposed to electromagnetic radiation. *Kruger,* Abstract. Kruger describes acoustic shielding techniques to minimize stray echoes and sources of noise, techniques for cancelling noise, modulation of the time between imaging pulses to randomize the effect of acoustic echoes, and a filtering technique applied to compensate for the frequency response of the transducers. *Id.,* Col. 3., lns. 15-26. "The aim is to reconstruct some property of the breast from an ensemble of pressure measurements made externally to the breast." *Id.,* Col. 10, lns. 18-20. "An array of sixty-four acoustic transducers 33 is located within imaging bowl 14 in tank 16 (sic)." *Id.,* Col. 6, lns. 1-2. The transducers should be evenly spaced across the array, and are positioned as illustrated in Fig. 6. *Id.,* Col. 6, lns. 3-5.

> Fig. 6 illustrates the positions of the transducers in the spiral array (some are shown in phantom). The position (r, θ, Φ) as is illustrated in Fig. 6. Each of the N transducers 33 is on the spherical surface (at a constant radius R), located at a unique (θ, Φ) coordinate, and is oriented on the surface with its axis passing through the center C of the radium of curvature of the spherically curved surface of imaging bowl 14. The Φ positions of the transducers 33 range from a minimum angle of Φ_{min}, approximately 16.6 degrees, to a maximum angle of Φ_{max}, approximately 72 degrees. It is desirable to maximize this range of angles, i.e., so that Φ_{max} -Φ_{min} is as large as possible, since doing so will enhance the

extent to which features in the imaged tissue can be reconstructed in multiple dimensions. (In some embodiments, Φ_{max} -Φ_{min} typically must be less than 45°; however, in the embodiment of FIG. 6, Φ_{max} -Φ_{min} approaches 90°.) *Id.*, Col. 9, lns. 34-51.

Fig. 3 illustrates a pair of dome-shaped shells 31*a* and 31*b* having an air gap 32 formed between them, thus forming an acoustic barrier that is electromagnetically transparent. *Id.*, Col. 7, lns. 11-23. Fig. 5A illustrates details of analog data acquisition circuitry that is positioned near transducer 33 to maximize signal strength and improve noise immunity. *Id.*, Col. 8, lns. 27-31. Thus, Kruger teaches arrangements of transducers and techniques for measuring acoustic waves in tissue when the tissue is exposed to electromagnetic radiation. Nowhere does Kruger teach or suggest determining a second set of imaging data from a first set of data.

The Examiner alleged that the element "deriving a second TCT dataset from the first TCT dataset," as related to claims 1, 13, and 24, is present at Fig. 12A, Item 98. *Office Action*, 10/12/06, p. 6. However, Item 98 merely teaches plotting values in two or three dimensions to generate a tissue image. *Kruger*, Fig. 12A. Step 98 is described in the specification as "the image data is plotted in two or three dimensions so that the tissue may be visualized." *Id.*, Col. 14, lns. 12-13. Nowhere in the cited location does this make <u>any</u> reference to "deriving a second TCT dataset from the first TCT dataset." Thus, the element is completely lacking from this cited location.

The Examiner stated that "in order to plot the image, Kruger teaches acquiring a set of TCT data from one portion, storing the signals, then determining (based (sic) the first set of signals and any previous sets of signals) whether or not the data have been collected for all the sixty-four angular orientations of the imaging bowl (Fig. 12B, step 112)." *Office Action*, 04/27/07, p. 8. The Examiner further stated, "If the data has not been collected for all the sixty-four angular orientations, then the imaging bowl is rotated 1/64 of a complete turn, positioning the transducers for the next set of signal measurements (Fig. 12B, step 114)." *Id.* The Examiner alleged that this set of steps "fully satisfies the language of 'acquiring' a first TCT set and then 'determining' or 'deriving' a second TCT set from the first TCT set." *Id.* The Examiner is in error in this regard.

Applicant is confused as to how merely acquiring a set of data at a number of angular orientations, as taught by Kruger, meets the claim language as called for in claims 1, 13, and 24. The Examiner is correct in that Kruger teaches acquiring data from transducers at a number of angular orientations. The Examiner is also correct in that Kruger teaches continuing to take data until data is acquired for all sixty-four angular orientations. However, nowhere does Kruger

teach or suggest <u>determining a second set</u> of TCT data <u>from a first set</u> of TCT data as called for in claim 1, nor does Kruger teach or suggest <u>deriving</u>, from <u>unacquired data from acquired data</u> as called for in claim 13, nor does Kruger teach or suggest <u>deriving a second</u> TCT <u>dataset from a first</u> TCT <u>dataset</u> as called for in claim 13. Rather, as even stated by the Examiner, Kruger simply acquires a dataset from a set of transducers and continues to do so until all the data is acquired.

In the Advisory Action, the Examiner alleged that "reconstructing an image of the imaging object based on the first set and the second set of TCT data is inherent as Kruger's goal." *Advisory Action*, 07/11/2007. However, nowhere does Kruger teach or suggest imaging an object based on a first set and a second set of TCT data. MPEP §2131 states that "[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." MPEP §2131 further requires that "[t]he identical invention must be shown in as complete detail as is contained in the ... claim" and that "[t]he elements must be arranged as required by the claim." Clearly Kruger does not meet this requirement.

In the Advisory Action, the Examiner suggested that Applicant "amend claim language to recite more details about how the second set of TCT data is derived from the first set of TCT data." *Advisory Action*, 07/11/2007. Such amendments are unnecessary to distinguish the claimed material from that taught by Kruger. Kruger does not teach or suggest determining a second set of TCT data from a first set of TCT data, and Kruger also does not teach deriving a second TCT dataset from a first TCT dataset.

As such, Applicant believes that which is called for in claims 1, 13, and 24 is not taught or suggested by Kruger and requests allowance thereof. In light of claims 2-3, 5-9, 16-19, and 25-26 depending from what are believed otherwise allowable claims, Applicant requests allowance of claims 2-3, 5-9, 16-19, and 25-26 based on the chain of dependency.

Claims 13 and 20 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kruger in view of Ben-Haim. Claim 13 is discussed above. Claim 20 calls for, in part, a computer programmed to acquire TCT data from an imaging object, and determine TCT data corresponding to a desirable transducer location about the imaging object not having a transducer location.

Kruger is explained above, and Ben-Haim does not resolve Kruger's deficiencies with respect to the rejected claims..

Ben-Haim teaches a locating system for determining the location and orientation of an invasive medical instrument relative to a reference frame. *Ben-Haim,* Abstract. The position and orientation of a distal end of a catheter are ascertained by use of two or three antennas, such as radiators 18, 20, and 22. *Id.* Par. [0103]. The three radiators are driven by a radiator driver 24 and, along with a signal processor 26, provide "a display or other indication of the position and orientation of the distal end 15 on a monitor 27." *Id.,* Par. [0105]. "[T]he field equations are derived specifically for each embodiment and are dependent on the geometry and characteristics of the radiators." *Id.,* Par. [0147]. In the preferred embodiment where the radiators are coils, for a coil with N turns, radius R, and current I, a series of vector equations are generated wherein a radial and tangential component are described. *Id.,* Pars. [0147-0148]. The tangential component includes an expression, $P_n(x)$, which is a Legendre Polynomial of degree n which may be calculated recursively through the method described. *Id.,* Pars. [0149-0153]. Thus, the field sensed by a remote sensor results in equations having known and unknown variables for any given coil. *Id.,* Pars. [0154-0155]. In the embodiment having three sensors, the technique described results in an overdetermined series of nine equations and six variables. With nine sensor readings, the unknowns may be numerically solved for by using, for instance, a Newton-Raphson method for non-linear systems, and "[t]he location sensor position and orientation are displayed on monitor 27." *Id.,* Pars. [0158-0159]. Thus, Ben-Haim describes obtaining a location and orientation of an invasive medical instrument using a numerical solution that includes a Legendre Polynomial.

Nowhere does Kruger or Ben-Haim or a combination thereof teach or suggest <u>deriving, from acquired data, unacquired data</u> for an imaging object as called for in claim 13. Nowhere does Kruger or Ben-Haim, or a combination thereof teach or suggest <u>determining TCT data corresponding to a desirable transducer location about an imaging object not having a transducer location</u> as called for in claim 20.

Accordingly, that which is called for in claims 13 and 20 is not taught or suggested by Kruger or Ben-Haim or a combination thereof. In light of claims 10-12, 14-15, 21, and 23 depending from what are believed otherwise allowable claims, Applicant requests allowance of claims 10-12, 14-15, 21, and 23 based on the chain of dependency.

Therefore, in light of at least the foregoing, Applicant respectfully believes that the present application is in condition for allowance. As a result, Applicant respectfully requests timely issuance of a Notice of Allowance for claims 1-27.

Applicant appreciates the Panel's consideration of these Remarks and cordially invites the Panel to call the undersigned, should the Panel consider any matters unresolved.

Respectfully submitted,

/Kent L. Baker/

Kent L. Baker
Registration No. 52,584
Phone 262-268-8100 ext. 12
klb@zpspatents.com

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P.O. ADDRESS:
Ziolkowski Patent Solutions Group, SC
136 South Wisconsin Street
Port Washington, WI 53074
262-268-8100